

Project Summary
2014 Scranton/Bowman
Contract AM-697-14
Contract AM-698-14
Contract AM-680-13



North Dakota Public Service Commission
Abandoned Mine Lands Division
600 East Boulevard Avenue, Department 408
Bismarck, ND 58505-0480

February 2015

**North Dakota Public Service Commission
2014 AML Project Summary
Scranton, North Dakota**

Project Type:	Drilling and Pressurized Backfilling with cementitious grout.
Primary Locations:	Scranton Equity Exchange Bypass Road & 133 rd Ave SW, Scranton
Project Dates:	June 16 — September 11, 2014;
Contractors:	B & C Concrete Pumping, Inc. of Williston (S&S Drilling, Williston-subcontractor) Northeast Technical Services, Inc. of Virginia, MN (Material Testing contractor) Water Supply, Inc. of Mandan (Ground Water Monitoring Contractor)
Total Project Cost:	\$753,097.35 (Drilling & Grouting) \$ 31,192.00 (Material Testing) \$ 16,262.80 (Groundwater Monitoring: 2013 & 2014)

The Public Service Commission (PSC) administers the Abandoned Mine Lands (AML) Program on behalf of the State of North Dakota. The AML Program is charged with eliminating existing and potential public hazards resulting from abandoned surface and underground coal mines. It is funded by a production tax on lignite coal mined in the state.

One of the earliest reclamation projects in the state was conducted near the Scranton Equity Exchange Elevator. In the 1980s, the ND PSC in cooperation with Dickinson State University daylighted a portion of the mine for complete reclamation. Daylighting is the removal of overburden over the abandoned underground mine. Other attempts to collapse the mine included dynamic compaction and super saturation. Neither of these worked adequately to reduce to occurrence of sinkholes on the property. Since the 1980s, several sinkhole filling projects reduced the hazards associated with collapses in parts of the mine.

The drilling and grouting project for 2014 represents the second phase of work in the Scranton-Bowman-Reeder area. Drilling and grouting was completed along the Scranton Equity Exchange bypass road. The mine, known under a variety of names including the Scranton Coal Mine, began operation sometime around 1909 and continued operation until about 1936. The underground portion was slope, double entry, room and pillar style with a strip mine long the western edge of the section. Typically the overburden ranges from 40-60 feet with a 19 foot coal seam that is divided by a clay lens through much of the area. Approximately 7-12 feet of the coal was mined.

Work was also conducted along 133rd Ave SW about 1/4 mile south of US Highway 12. This area has experienced a number of reoccurring sinkholes including 2014. The mine in this area was the Scranton Lignite Coal Company otherwise known as Andy's Mine and operated from before 1923 to 1946. Like the Scranton Coal Mine, it was a slope, double entry, room and pillar mine. The overburden is approximately 75 feet with a coal thickness of 17 feet. Of that, 9 feet were mined. The majority of the coal was for local use with about 3,000-5,000 tons produced per year. The highest outputs topped 7,500 tons/year in 1937, 1943 and 1944. All produced for the local trade.

Cover Photo: Pumping grout in west ditch of 133rd Ave SW about 1/4 mile south of US Highway 12. The grout pump is a Putzmeister TKB 80 Trailer-Mounted Pump. This is the same area where numerous sinkholes have been filled in the past, including in 2014. Over 300 yards were pumped into 5 cased holes surrounding this sinkhole area.

Work Summary

The collapse of underground mines near the Scranton Equity Exchange bypass road (SEEBR) and 133rd Avenue SW in Scranton, ND have resulted in sinkholes dangerously near these roads. Drilling and grouting remains the most cost effective and efficient way to reclaim underground mines. In this process, holes are drilled into the mine, and a cementitious grout is pumped into the voids (open spaces in the mine). The ND PSC AML Division determined it necessary to reclaim the underground mines for public safety.

Work on Scranton/Bowman Phase 2 AML Project began on June 16, 2014 along the northeast side of the Scranton Equity Exchange bypass (Map 1). Drilling continued from the last hole drilled in 2013 on the west side of the bypass road near the municipal landfill and proceeded southward at 10 foot intervals. An additional 39 holes were drilled for a total of 380 holes along and near the Scranton Equity Exchange bypass road. Grouting proceeded southward along the east side of the bypass road and then to the newly drilled holes and finally to the voids discovered while drilling the monitoring wells. Work was completed along the bypass road on July 8, 2014 with a total of 5,025 cubic yards of grout at a cost of about \$1.3 million dollars (Map 2).

The project continued with the reclamation of Andy's Mine south of Scranton (Map 3). Holes were drilled along the western side of ND Highway 67 (133rd Avenue SW) starting near the last hole drilled in 2012 and moving south until the ditch became too steep for drilling. The west ditch was also drilled from the estimated northern most point of the mine and continued southward in the ditch for 100 feet. Drilling then moved to the east side of the ditch from the northern part of the mine southward for 600 feet at 10 foot intervals. Of the 109 holes drilled 33 encountered voids or rubblized areas. This area accounted for 1,530 cubic yards of grout. Four holes remain to be pumped. It is anticipated that mine reclamation in Scranton will be completed in the 2015 construction season.

Groundwater monitoring will continue along the Scranton Equity Exchange bypass road as well as at a nearby residential irrigation well through 2015 with samplings occurring in the late spring and early fall. Five sinkholes were filled under this contract as well. Two near the SEEBR, 2 on Tracy Schumacher's property and one in the west ditch of 133rd Ave SW near Randy Seifert's. Project statistics and drilling and grout summaries of the 2014 Scranton/Bowman Phase 2 AML project can be found on the attached tables.

This AML Project reduced the likelihood of death or injuries to property owners and the public and of property damage by stabilizing undermined segments of roads used by the public. Work has been completed on the Scranton Equity Exchange bypass road; however budgetary constraints required this work to be conducted in phases at the Scranton/Bowman/Reeder sites and additional phases will be needed in the future to continue stabilizing underground mines in high-use areas.

ND PSC AML Division
ND STATE CAPITOL, 13TH FLOOR
BISMARCK, ND 58505
701-328-2400



● 2
● 3
● 207
● MW

MW

● 8
● 4
● MW

MW

271

MW

● 75
● 67
● 64
● 59
● 52
● 43
● 37
● 264
● 268



**2014 Scranton/Bowman Phase 2
Scranton Equity Exchange
Bypass Road (SEEBR)**

● Coal	● Grout
● Filled Adjacent	● Void
	● MW Monitoring Wells

Map 1





**All Drilling and Grouting (2012-2014)
Scranton Equity Exchange
Bypass Road (SEEBR)**

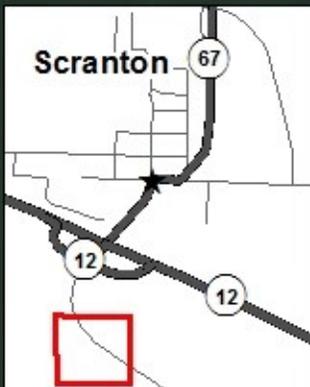
● Coal	● Grout
● Filled Adjacent	● Void
	○ MW Monitoring Wells

Map 2





ND PSG AML Division
ND STATE CAPITOL, 13TH FLOOR
BISMARCK, ND 58505
701-328-2400



Map 3

**2014 Scranton/Bowman Phase 2
133rd Avenue SW**

● Coal	● Grout
● Filled Adjacent	● Void



2014 Scranton/Bowman AML Project Statistics

Project Dates	June 16– July 26, 2014
Project Length (consecutive days)	41
Total Work Days	30
Total Days of Pumping Grout	27
Holes Drilled	148
Holes Cased	50
Feet Drilled	10,998
Feet Cased	1,526
Grout Pumped (cubic yards)	3,056
Grout Pumped (cubic yards) per Grout Day	113
Holes Pumped	49
Holes filled by Pumping Adjacent Holes	41
Average Grout Take (cubic yards) per Hole pumped	62
Average Grout Take (cubic yards) per Hole filled	34
Remaining holes to be pumped at 133rd Ave SW	4
Slump-Project Average (inches)	10.7
Yield-Project Average (cubic foot/cubic yard)	27.5
Scranton Equity Exchange Bypass Road (SEEBR) Cumulative Data	
Total Holes Drilled (2012-2014)	380
Number of Holes Pumped (2013-2014)	59
Total Grout pumped (cu. yds.) (2013-2014)	5,025
No additional work remains at SEEBR	

2014 Scranton/Bowman AML Project Drill Hole Data

Hole_ID	DrillDate	Upper Coal	Lower Coal	Void	Rubble	Feet Drilled	Feet Cased	Comments
Scranton Equity Exchange Bypass Road								
235A	6/25/14	32-50	60-74			75		about 10 ft south of 234-13
235	6/25/14	32-50	60-74			75		
236	6/25/14	30-50	60-74		15-30	75	10	
237	6/25/14	32-50	60-74			75		
238	6/25/14	32-50	60-74			75		
239	6/25/14	48-50	60-74			75		Clay/Grout from 30-48
240	6/25/14	48-50	60-74			75		Clay/Grout from 30-49
241	6/25/14	48-50	60-74			75		Clay/Grout from 30-50
242	6/25/14	48-50	60-74			75		Clay/Grout from 30-51
243	6/25/14				30-75	75	25	loose rubble 30-48; tight rubble 48-74
244	6/25/14	32-51	60-74			75		
245	6/25/14	32-51	61-74			75		
246	6/24/14				20-74	74	15	loose rubble 20-46; tight rubble 46-74
247	6/24/14	30-50	60-73			74		
248	6/24/14				30-74	74	25	loose rubble 30-48; tight rubble 48-74
249	6/24/14	31-51	61-73			74		
250	6/24/14				30-74	74	25	loose rubble 30-49; tight rubble 49-74
251	6/24/14	31-51	61-73			74		
252	6/24/14	31-51	61-73			74		
253	6/24/14	31-51	61-73			74		
254	6/24/14	31-51	61-73			74		
255	6/24/14	31-51	61-73			74		
256	6/24/14	31-51	61-73			74		
257	6/24/14	31-51	61-73			74		
258	6/24/14	31-51	61-73			74		
259	6/23/14				20-73	73	21	20-50 loose rubble; 50-73 tight rubble
260	6/23/14	30-50	60-72			73		
261	6/23/14	30-50	60-72			73		
262	6/23/14	31-50	60-72			73		
263	6/23/14				14-60	60	9	loose rubble 14-48; tight rubble 48-60
264	6/23/14	49-50			22-60	60	20	loose rubble 22-49; tight rubble 50-60; coal 49-50? Firm
265	6/23/14	49-59	59-72			73		
266	6/23/14	30-49	58-72			73		
267	6/23/14			15-18	18-40	40	10	loose rubble 18-40
268	6/19/14			24-27	27-50	50	19	loose rubble 27-50
269	6/19/14				26-48	60		unable to drill past 60 ft
270	6/19/14	30-50	60-72			73		
271	6/26/14	54-60	71-83			84	20	adjacent to sinkhole in ditch
272	6/26/14	54-64	71-83			84	25	south of 271; upper coal is mixed with clay
Total Feet at Scranton Equity Exchange bypass road						2811	224	
SOUTH SCRANTON								
401	6/26/14	50-72				73		South Scranton site; west side of road near the approach
402	6/26/14	50-72				73		10 ft south of previous
403	6/26/14	63-72			57-63	73	52	
404	6/26/14	62-73			37-62	73	32	Coal may have been tight rubble
405	6/26/14	61-73			43-61	73	38	Coal may have been tight rubble
406	6/26/14	60-73				74		coal mixed with clay
407	6/26/14	60-73				74		
408	6/26/14	60-73				74		

2014 Scranton/Bowman AML Project Drill Hole Data

Hole_ID	DrillDate	Upper Coal	Lower Coal	Void	Rubble	Feet Drilled	Feet Cased	Comments
SOUTH SCRANTON								
409	6/27/14				50-70	70	45	Loose rubble 50-60; tight rubble 60-70
410	6/27/14	47-50		50-53	53-74	74	45	rubble is tight/coal
411	6/27/14	48-60	64-73			74		
412	6/27/14	48-60	64-73			74		
413	6/27/14	48-50		50-52	52-73	73	45	
414	6/27/14	48-49		49-52	52-60	60	44	Loose Rubble 52-56; Tight Rubble 56-60
415	6/27/14	47-70				71		
416	6/27/14	46-69				70		
417	6/27/14	45-70				71		
418	6/27/14	45-70				71		
419	7/1/14	45-70				71		
420	7/1/14	40-67				68		67 ft W of CL of 133rd Ave; 23 ft N of CL of approach
421	7/1/14	42-67				68		
422	7/1/14	44-67				68		
423	7/1/14	44-69				70		
424	7/1/14	46-69				70		
425	7/1/14	45-69				70		
426	7/7/14	44-69				70		
427	7/7/14	44-60	64-66			67		
428	7/7/14	44-60	64-66			67		
429	7/7/14	44-60	62-66			67		
430	7/1/14	44-45			45-60	60	40	45-55 Loose Rubble, 55-60 Tight Rubble
431	7/7/14	44-69				70		
432	7/7/14	44-66				67		
433	7/7/14	44-66				67		
434	7/7/14	44-66				67		
435	7/7/14				30-60	60	25	50-60 tight rubble or coal
436	7/7/14				30-60	60	25	54-60 tight rubble
437	7/7/14	25-46	46-60			60	20	24-46 loose coal
438	7/7/14	46-66				67		
439	7/7/14	46-60	64-67			68		
440	7/7/14	45-68				68	40	loose coal clay mix
441	7/7/14	48-68				68	40	loose coal clay mix
442	7/7/14	48-68				68	43	loose coal clay mix
443	7/7/14	48-69				70		
444	7/7/14	48-50			50-70	70	45	tight rubble or coal 60-70
445	7/7/14	48-70				70		coal/clay tight
446	7/7/14	48-70				70		coal/clay tight
447	7/7/14	52-70				71		
448	7/7/14	50-70				71		
449	7/7/14	50-70				71		
450	7/7/14				40-70	70	35	tight rubble 60-70
451	7/7/14				40-70	70	35	tight rubble 60-70
452	7/8/14				50-70	70	45	tight rubble 60-70
453	7/9/14	56-75				76		
454	7/9/14	54-74				75		
455	7/9/14				40-75	75	35	tight rubble 60-75
456	7/9/14	54-74				75		coal/clay mix
457	7/9/14	54-55		55-57	57-75	75	50	tight rubble
458	7/9/14			48-49	49-75	75	43	tight rubble
459	7/9/14	58-74				75		

2014 Scranton/Bowman AML Project Drill Hole Data

Hole_ID	DrillDate	Upper Coal	Lower Coal	Void	Rubble	Feet Drilled	Feet Cased	Comments
SOUTH SCRANTON								
460	7/9/14	54-75				75		coal/clay mix
461	7/9/14	54-75				77		
462	7/9/14	54-74				75		
463	7/9/14				35-60	60	30	loose rubble
464	7/10/14				47-75	75	42	loose rubble
465	7/10/14	60-76			45-60	76	40	loose rubble
466	7/10/14	62-77				77		2 ft S of mark
467	7/10/14	63-77				78		
468	7/10/14	63-77				78		
469	7/10/14				49-78	78	44	tight rubble 64-78
470	7/10/14				45-78	78	40	tight rubble 68-78
471	7/10/14			30-32	32-60	60	25	loose rubble
472	7/10/14				42-60	60	38	loose rubble
473	7/10/14	60-80				81		
474	7/10/14	60-80				81		
475	7/10/14				51-80	80	46	tight rubble 72-80
476	7/10/14			50-59	59-80	80	45	large dry void. used borehole camera. could see tape in 477
477	7/10/14			55-59	59-80	80	50	tight rubble 66-80
478	7/10/14	64-69			69-80	80	65	tight rubble 73-80
479	7/10/14	64-80	82-85			86		
480	7/11/14	65-80	82-85			86		
481	7/11/14	65-80	83-85			86		
482	7/11/14	66-81	84-86			87		
483	7/22/14	67-81	84-86			87		
484	7/22/14	67-81	83-86			87		
485	7/22/14	68-81	83-87			88		
486	7/22/14	69-82	84-88			89		
487	7/22/14	70-82	84-88			89		
488	7/22/14	70-85	88-90			91		
489	7/22/14			20-27	27-60	60	15	5 ft N of TC12-174
490	7/23/14					60		5 ft S of TC 12-174
491	7/23/14	60-81				82		10 ft S of TC12-185
492	7/23/14	60-81				82		
493	7/23/14	60-81				82		
494	7/23/14	60-82				83		
495	7/23/14	60-82				83		
496	7/23/14	60-82				83		
497	7/23/14	60-82				83		
498	7/23/14	61-83				84		
499	7/23/14	62-83				84		
500	7/24/14	62-84				85		
501	7/24/14	60-84				85		
502	7/24/14	64-84				85		
503	7/24/14	64-85				86		
504	7/24/14	65-85				86		
505	7/24/14	65-86				87		
506	7/24/14	25-27	71-92			93		300 ft S of 505-14
507	7/24/14	71-92				93		
508	7/24/14	71-92				93		
509	7/24/14	71-92				93		
						10998	1526	Total Footage

2014 Scranton/Bowman AML Project

Grout Data

Hole ID	Void Top	Void- Bot	Rubble Top	Rubble Bot	Drilled Total	Cased Total	GroutDate	Grout Total	GroutComments
Scranton Equity Exchange Bypass Road									
207-13					97		6/16 6/16	4	COAL HOLE. Short piece of casing put in. Continue pumping in next phase. Total for the hole = 70 yds
1-13	59	66	66	67	67	54	6/23 6/23	112	Near Monitor Well 2. Suspended due to weather & inability to drive in field. Total for the hole = 623+112 =735
2-13			50	70	70	45	6/25	40	
3-13			27	60	60	22	6/24	185	Grout up annulus at 152 yds-casing broken but pumped another 33 yds. Wash water came up annulus,
4-13	44	46	46	60	60	39	7/7	127	blowout near tire of van filled 5-13 & 6-13. casing broken and back filled
5-13			40	60	60	35			Filled by 4-13
6-13	20	22	22	40	40	15			Filled by 4-13
7-13			50	60	60	39			Filled by 9-13
8-13			30	60	60	25			Filled by 9-13
9-13			40	60	60	35	7/8	144	blowout on RR embankment in 2 places
10-13			35	60	60	30	7/8		Filled by 9-13. pumped and took 2 hoppers. Refused up annulus and repacked 3 times
36-13			35	50	50	30			Filled by 37-13
37-13			30	50	50	25	7/2	83	Blowout in ditch
40-13	32	35	35	50	50	26			Filled by 42-13. Casing broken and backfilled
41-13	18	20	20	50	50	13			Filled by 42-13. Casing pulled and backfilled
42-13			16	40	40	11	7/2	14	Blowout in ditch in 2 places between holes 41-13 and 40-13.Casing pulled and backfilled
43-13	17	19	23	60	60	12	7/1 7/2	113	Blowout in ditch near Hole 42-13. Casing pulled and backfilled.
49-13	10	13	13	40	40	5			Filled by 50-13
50-13			25	32	40	20	7/1	9	Road cracked around hole 49-13. Grout came up annulus and through the crack.
51-13			32	40	40	28	7/1	8	Refused wash water at end of day
52-13			25	40	40	20	6/27	67	
53-13			27	40	40	22			Filled by 56-13
54-13			10	40	40	5			Filled by 56-13
55-13	20	23	23	40	40	14			Filled by 56-13
56-13			25	40	40	20	6/27	58	Blowout in ditch
57-13	23	25	25	40	40	18	6/26	79	Blowout in ditch near Hole 243-14
58-13	23	25	25	40	40	18	6/26	29	Road cracked at 10 yds. Grout came up in Hole 247-14 at 21 yds. Blowout in ditch between Hole 247-14 and 248-14.
59-13			40	50	50	35	6/26 6/27	14	
61-13			40	60	60	35			Filled by 64-13
62-13			38	50	50	33			Filled by 64-13
63-13			30	48	50	25			Filled by 64-13
64-13			30	50	50	25	6/19 6/23	49	Road Cracked 1/2" wide running from Hole 62-13 across the road toward the SW.

2014 Scranton/Bowman AML Project Grout Data

Hole ID	Void Top	Void Bot	Rubble Top	Rubble Bot	Drilled Total	Cased Total	GroutDate		Grout	GroutComments
Scranton Equity Exchange Bypass Road										
65-13			30	50	50	25				Filled by 67-13
66-13			30	50	50	10				Filled by 67-13
67-13			30	50	50	25	6/17	6/19	91	Blowout in ditch near hole in two places
71-13			30	35	50	25				Filled by 72-13
72-13			35	48	50	30	6/17		39	Blowout in opposite ditch
73-13			35	46	50	30	6/17		9	refused up annulus
74-13			30	46	50	25	6/17		3	refused up annulus
75-13			32	50	50	27	6/17		34	Blowout in near ditch
236			15	30	75	10	7/3		24	
243			30	75	75	25	7/3		43	
246			20	74	74	15				Filled by 58-13
248			30	74	74	25	7/3		18	
250			30	74	74	25				Filled by 56-13
259			20	73	73	21				
263			14	60	60	9				
264			22	60	60	20	7/2	7/3	33	
267	15	18	18	40	40	10				
268	24	27	27	50	50	19	7/2		13	
271					84	20				Filled by 272-14
272					84	25	6/26		23	Blowout in ditch near 272-14 and N of the sinkhole.
SOUTH SCRANTON										
403			57	63	73	52				Filled by 404-14
404			37	62	73	32	7/14	7/15	164	Blew casing of 403-14 35ft into the air. Minor crack- ing near shoulder of road between 403 and 405.
405			43	61	73	38				Filled by 404-14
409			50	70	70	45				Filled by 410-14
410	50	53	53	74	74	45	7/11	7/14	118	Refused at 120 psi
413	50	52	52	73	73	45				Filled by 414-14
414	49	52	52	60	60	44	7/8	7/10	236	
TC12-154										Filled by 410-14
TC12-158							7/14		29	Blowout in filled sinkhole near TC12-158
TC12-159							7/14		8	
TC12-167							7/16		118	Cracked in ditch near road 1/2-1" wide. 2-3 hairline cracks on road shoulder (paved portion)
TC12-174							7/25	7/26	34	Took Bore Hole Camera images prior to filling. Casing pulled due to erosion of annulus and gravity filled. Confirmation drill site for 2015

2014 Scranton/Bowman AML Project Grout Data

Hole ID	Void Top	Void Bot	Rubble Top	Rubble Bot	Drilled Total	Cased Total	GroutDate	Grout	GroutComments	
South Scranton										
430			45	60	60	40	7/16	25	Refused wash water. Casing pulled and backfilled	
435			30	60	60	25	7/17	152	Wash water came up annulus and near th hole.	
436			30	60	60	25	7/18		Immediate refusal (Filled by 435-14)	
437					60	20	7/18		Immediate refusal (Filled by 435-14)	
440					68	40			Filled by 441-14	
441					68	40	7/18	26		
442					68	43			Filled by 441-14	
444			50	70	70	45	7/18	56	Refused wash water. Casing pulled and backfilled	
450			40	70	70	35	7/21	139	Blowout near hole.	
451			40	70	70	35			Filled by 451-14	
452			50	70	70	45			Filled by 451-14	
455			40	75	75	35	7/23	4	Blowout under pump	
457	55	57	57	75	75	50	7/23	26	Blowout under truck (same spot as blowout for hole 455). About 1 yd on ground	
458	48	49	49	75	75	43	7/23	37	Blowout on upslope of ditch near bobcat.	
460					75				Filled by 458-14	
463			35	60	60	30	7/23	9	Came up annulus with force just as pump was shut off.	
464			47	75	75	42	7/24	133	Blowout on upslope of ditch near the hole	
465			45	60	76	40	7/24	1	Refused up annulus twice	
469			49	78	78	44			Filled by 471-14	
470			45	78	78	40			Filled by 471-14	
471	30	32	32	60	60	25	7/24	7/25	84	Grout up annulus of 470-14. put in 2 posts-still refused
472			42	60	60	38	7/25	95	Blowout on upslope of ditch near hole 467. About 2 yds on ground	
475			51	80	80	46	7/26	36	Possible to pump in next phase	
476	50	59	59	80	80	45				
477	55	59	59	80	80	50				
478			69	80	80	65				
489	20	27	27	60	60	15				

2995

57 cu yds were used for backfilling drill holes; 4 yds in a sinkhole



Above: Grout discharged from mixing truck into the grout pump to be pumped into underground voids.

Below: Material tester, Bill Ray (Northeast Technical Services) prepared compression strength cylinders. Grout must meet a minimum 150 psi compressive strength. Grout pump can be seen in the upper right.





Above: 35 feet of casing on a hole near ND Highway 67 has been forced out of the ground while pumping on another hole. This indicated that the holes are connected by void space in the mine.

Below: The white pin flags mark holes drilled into the mine on the west side of ND Highway 67.





Upper left: The crack in the Scranton Equity Exchange bypass road was cased by surface lifting. As the grout was pumped into the void spaces under the road, it became so full that it eventually raised the surface of the road enough to cause it to crack. This is confirmation that the grout was pumped to where it was intended: under the road.

Upper Right: The grout pump is on the left and the mixer truck is being used to back fill the non-void drill holes.

Lower Left: A shot down a drill hole. The bright spot in the center is the reflection of the camera flash of the water on top of the grout.



Upper left: Grout gushing from an adjacent hole indicating that the holes are connected. The hole was plugged with a post and pumping continued.

Upper Right: Water injection drilling. The black is coal.

Lower Left: Grout has broken through the surface while pumping grout near the railroad embankment of the Scranton Equity Exchange spur.